UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF
AIR AND RADIATION

Dr. Inés Triay, Manager
Carlsbad Field Office
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Dear Dr. Triay:

Enclosed to this letter are our detailed comments (Enclosure A) on the Department of Energy (DOE)'s December 2002 notification package containing the proposed remote-handled (RH) transuranic (TRU) waste characterization plan and the RH TRU waste characterization program implementation plan (WCPIP). On March 12, we provided to DOE (via e-mail) Flow Charts (Enclosure B) intended to capture EPA's expectations for an overall characterization process and key elements that we view as crucial to an adequate RH waste program. These comments, together with the Flow Charts, suggest the contents of DOE's RH proposal that would be workable for us and could support DOE justification for why the RH waste characterization program is different from the one for contact-handled (CH) TRU waste. On March 10, you submitted revisions to the December 2002 notification reflecting discussions that took place during a February 20 conference call between DOE and EPA. We have not yet fully evaluated DOE's March 10 submission, which may address some of our enclosed comments.

DOE has indicated that the WCPIP is the major implementation document for the RH program. Therefore, the majority of our comments focus on the WCPIP. The waste characterization plan should reflect any subsequent revisions to the WCPIP. In your notification you requested EPA to: (a) approve a less prescriptive approach for RH waste characterization than that applied for CH waste characterization, based on a stated need for flexibility to develop site-specific RH waste characterization programs; and (b) allow DOE to use a conservative estimate of the weights of cellulosics, plastic, and rubber (CPR) contents of RH waste containers in lieu of actual CPR content. In principle, this approach may be feasible, but below we discuss potential impacts of such an approach.

Implications of Flexibility to Sites Characterizing RH Waste

We understand that DOE intends the RH waste characterization process to be site-specific due to the variability in radiological characteristics of RH waste and the availability of waste-specific information. Taking into account such flexibility, the DOE RH proposal should provide detailed guidance and criteria for each of the required TRU waste characterization (WC) components and possible alternatives (dose-to-curie, <100% radioassay, destructive assay). This would clarify to EPA and the sites the capabilities of each of the WC components and the

adequacy of the resulting waste data to show compliance with the WIPP Certification. Also, because DOE is seeking approval of a more "general" characterization approach, the characterization program at each facility (and perhaps for each waste stream or grouping of waste streams at the facility) must be closely scrutinized by EPA to ensure that the program in place is technically defensible in all aspects and areas. To achieve this, prior to and during WC inspections, EPA is likely to require additional information and justification from each RH site to ensure that the program is acceptable. Alternatively, if DOE chooses to present more information in this submission regarding DOE's RH waste acceptance criteria and decision making pathways, etc., EPA's review burden (and, potentially, time to approve RH programs at sites) would be reduced.

Note that when examining an individual site's detailed RH waste characterization program for acceptability, we reserve the right to require additional waste characterization beyond the minimum specified in the DOE's RH proposal. For example, if a site cannot demonstrate to our satisfaction that the compiled acceptable knowledge and confirmatory data collection programs are acceptable, EPA could require more sample collection than suggested by this proposal. In short, if DOE requests flexibility in program implementation, we must exercise similar flexibility in program approvals.

Implications of Waste Material Parameter Assumptions:

The DOE is required by the terms of the initial WIPP certification to meet or not to exceed certain waste material parameter limits, including limits for CPR and metals. However, DOE proposes no examination of wastes for waste material parameters during waste packaging, proposing instead to use conservative assumptions regarding the weight of CPR in waste containers. The proposed assumptions with respect to CPR and ferrous/non-ferrous metal are requested due to the difficulty in obtaining this information in a hot cell at the level of detail congruent with that obtained in the CH program. We recognize that there are some inherent difficulties in visually examining RH waste. Furthermore, RH represents a small volumetric percentage of the total waste emplaced in WIPP and the vast majority of TRU wastes (namely, CH) are undergoing detailed waste material parameter assessments. For these reasons, we believe that the approach of using conservative assumptions (in place of visual examination) can be reasonably applied to CPR and ferrous/non-ferrous metals with regard to meeting overall inventory limits.

However, certain characterization methodologies, such as dose to curie (DTC), rely upon physical state information to accurately characterize radiological contents. Sites opting to use such methods can obtain volumetric/mass information specific to the CPR contents of waste through nondestructive evaluation or visual examination (VE). The RH proposal, therefore, must specify how sites can collect adequate information on CPR for such methodologies and clarify what estimates and information will be reported in the WIPP Waste Information System. In summary, while we can accept simplified estimates of CPR and ferrous/non-ferrous metals for the purpose of waste inventory limits, sites may still need to conduct VE or use alternative methods to obtain more detailed waste material information that is crucial to adequately implement DTC or other characterization methodologies.

We understand that, around mid April, DOE plans to provide EPA a revised RH TRU waste notification that responds to the detailed comments on the December 2002 submission and to issues discussed during the February 19 EPA/DOE conference call and addressed in the March 10 revised submission. We would be available for a conference call the week of March 31. If you have questions regarding our comments, please contact Rajani Joglekar at (202) 564-7734.

Sincerely,

Frank Marcinowski, Director
Radiation Protection Division

Enclosures

cc: Lynne Smith, DOE HQ
Matthew Silva, EEG
Steve Zappe, NMED

COMMENTS ON THE DECEMBER 2002 RH PROPOSAL

Remote-Handled Transuranic Waste Characterization Plan

We have reviewed the Characterization Plan in detail, and understand that DOE does not intend to use this plan to implement the RH program at generator sites; the Waste Characterization Program Implementation Plan (PIP) serves this purpose. Based on our current understanding of the intended characterization approach and our comments concerning this approach, we believe that the PIP shall be modified to address specific concerns (see comments below). We recommend that corrections to the Waste Characterization Plan be made after revising the PIP. Items in the Characterization Plan that may require revision include but are not limited to:

- Removal of all discussion of SNL modeling performed post-CCA

- Section 2.1— Clarify characterization process as per PIP comments, including actual role of VE (impression is given that this process will be as rigorous as the CH program, when it is not). Discuss clearly the applicability of 40 CFR §194.22(b) processes to waste characterization, when it has been pointed out that the §194.22(b) process was included in the EPA rule to address performance assessment input such as hydrologic parameters, etc. Clarify applicability of NQA-3 Supplement 3SW-1 Section 9 with respect to waste characterization.

- Revise Figures 1 and 2 and associated descriptive text in accordance with changed PIP.

- Section 2.2— Change Sections 2.2.1-2.2.9 in accordance with PIP comments. For example, language in Section 2.2.1 states that AK, DTC, Qualification of AK, and Radioassay will all be used to determine TRU Activity Determination, when the current PIP implies that Qualification of AK will be the primary process, using peer review, confirmation, or qualification of QA programs.

- Sections 3.1 to 3.2 — Change section in accordance with PIP revisions. Remove statements inferring that VE is the primary characterization process for the RH program; while the opportunity to collect additional analytical information can occur during packaging, the RH VE process itself is less rigorous than the CH VE process. Justify in detail the assumptions associated with CPR—i.e., SWCG S3000 and S4000 can contain up to 49% CPR and still be considered S3000/4000—is the amount of S3000 and S4000 anticipated to be so small as to be adequately "covered" by S5000 assumptions. Revise Table 3-1 to concur with PIP changes, and change the Table 3-1 "CH-TRU" rows to more accurately reflect the current CH program (e.g., the current program requires measurement that is not considered by EPA as being a §194.22(b) AK confirmation activity, particularly where AK indicates a spectrum of radionuclides that might be present in unpredictable isotopic ratios, quantities, or occurrences, such as from laboratories or experimental programs). Revise Table 3-2 to remove inferences to post CCA modeling under justification columns and to reflect PIP changes.

- Section 3.3—Revise section in accordance with PIP revisions, particularly in the areas of required documentation. Table 3-3 is incongruent with the current PIP; for example, VE is not cited as a "stand alone" CPR or liquid identification method. As presented, the Table implies that there is a characterization process outside of the §194.22(b) process cited in the current PIP. Table 3-3 may also require revision to address PIP comments, particularly in the area of AK accuracy. Discussions pertaining to radiography, VE, etc. state that information will be collected outside of the AK, however, §194.22 qualification pathway are not addressed in the current PIP.

- Section 4.0—Revise to remove discussion of SNL modeling.

Supplement A - We believe that the purpose of Supplement A was to simply show that characterization of RH waste using CH methods and under lesser shielding, etc., conditions used for CH waste results in higher dose. The supplement does not address whether the current CH procedures could be implemented, with appropriate safeguards, shielding, etc., to characterize RH waste. If DOE wants to continue to make the higher dose and exposure risk argument, the supplement should address why the DOE cannot implement the CH program elements under modified RH conditions (e.g. shielding), that will be put in place to limit worker exposures would need to be addressed. Related to this aspect, the following areas should be addressed: selection criteria for potential RH workers; RH-specific radiological training; real-time dose tracking; supplementary dosimetry requirements; and Bioassay requirements for RH workers.

Supplement B - We believe that the intent of Supplement B was to present the possibility that the radiological characteristics of some RH waste will sometimes preclude the use of current CH waste NDA and NDE systems to characterize RH waste. This does not mean that NDA and NDE cannot be used to characterize any RH waste, but that their use could be limited by the radiological characteristics of some RH waste. This conclusion appears logical and nothing more than the simple conclusions can be inferred from the information provided in Supplement B. The supplement does not describe effects of site's inability to measure radiological content on the determination of TRU vs. low level waste and uncertainty associated with making the determination on AK alone. The submittal should describe how uncertainties in AK data will be developed, and how these will be propagated through the determination of TRU vs. low level waste. The supplement implies the ancillary measurement data will be developed individually at each site. A clear guidance that describes the data quality requirements for each proposed method of developing ancillary measurement data must be provided to the sites. Also, DOE should develop acceptable statistically based approaches to performing isotopic quantification and confirmation of AK information. DOE has not provided an analysis of why various neutron assay methods with some type of shielding or other means would not be viable alternatives to gamma assay for determining the concentration of key isotopes.

Supplement C - We believe that Supplement C was included for informational purposes and EPA approval of this section is not required. The RH TU inventory-based radionuclides identified in Supplement C, Table 3 are different than those contained in the TWBIR, Table 3.11

making it difficult to accurately compare the RH-TRU waste inventory volumes. DOE did not use consistent isotope lists when preparing its inventories. A comparison of the volumes presented in this supplement and TWBIR, Revision 3 indicates that there has been a two-fold increase in the amount of RH-TRU waste currently stored and projected to be generated from previous DOE estimates (i.e., TWBIR, Revision 3). However, the total amount of RH-TRU waste planned for disposal has remained relatively constant. The supplement does not contain information on the total isotope-specific activity as was provided in TWBIR, Table 3.11. Therefore, it is not possible to compare the total isotope-specific activity (i.e., total curies) of RH-TRU waste from the two inventories. Total curies reported in DOE's *Notice* are estimated at 662,000 Ci. The total activity described in the TWBIR is estimated at 886,000 Ci. The reasons for the differences are not clear.

Supplement D - No comments. Supplement D should be removed in its entirety.

Supplement E - DOE proposes to use the same approach that is used in the MARSSIM for determining the number of samples to collect. However, we do not believe that the MARSSIM approach can be used universally. We consider the MARSIMM to just be an example of how the sample number could be derived. EPA expects waste-specific determination of the number of samples to be collected, and recommends that DOE consider developing criteria to ensure data generated from characterization activities is appropriate for the intended characterization decisions that must be made. DOE should examine the following documents and other similar documents for assistance in defining assessment plan development criteria:

- *Guidance for the Data Quality Objective Process (EPA QA/G-4)*
- *Guidance for Data Quality Assessment, Practical Methods for Data Analysis (EPA QA/G-9)*

The notification does not identify which RH characterization processes would employ the sampling statistic provided as Supplement E. For each waste characterization process DOE should identify sampling methods and establish sampling statistic criteria that are appropriate to the confirmation activity performed and that are consistent with established data quality objectives for the confirmation activity. DOE should establish criteria for ensuring that the adequacy of all sampling activities are verified by examining collected characterization data to determine that (a) result distribution assumptions were correct (parametric or non-parametric), (b) appropriate data transformations are performed, and (c) adequate numbers of samples are collected to meet defined error tolerance criteria. DOE should specify criteria for developing site specific assessment plans which would ensure that data generated from characterization activities is appropriate for the intended characterization decisions that must be made.

Waste Characterization Program Implementation Plan (PIP)

General Comments:

1. The Flowcharts provided by EPA (via the March 12 e-mail) present a characterization process that reflects information in the current PIP, as well as our understanding of the intended methodologies as presented in DOE-EPA meetings. In addition, it presents key EPA review elements that are not presented in the PIP, but which we view as necessary to ensure appropriate EPA approval is sought at critical characterization junctures.

The Flowcharts show the general characterization scheme, similar to that shown in Figures 1 and 2, but "breaking out" radioassay options with respect to DTC and DA. We did not prepare similar flow charts for less than 100% NDA, as this option is not well addressed in DOE documentation. However, development of such a flow chart would be useful to the sites. In addition to the general processes followed for these radioassay options, we provided general thoughts on what the Confirmatory Testing Plan (page 50 of the December PIP) should address (Chart 2). Similar charts or listings should be developed for other radioassay mechanisms.

The intent of the Flowcharts is to provide information regarding the overall characterization process that is perhaps clearer and more detailed than that discussed in the PIP. In addition, the charts also provide key elements that EPA believes crucial to any plan developed by DOE and/or sites to use certain radioassay methods.

2. The Flowcharts provide some elements that are not included in the current PIP, but which EPA believes important to this type of program. These elements (as well as some not shown on the Flow Charts) are also discussed in the detailed comments, and include the following:

- Early involvement of the entire characterization team in the AK process is required to ensure adequate compilation
- AK data assembly must mandate the acquisition of all container-specific data with respect to radionuclides, recognizing that this information may not exist in some cases.
- If AK data are lacking or DOE would elect to collect information separate from the qualification process, a Data Acquisition Plan should be prepared documenting what is to be collected, and EPA review/approval of the plan will be necessary.
- The Certification or other Plan should be prepared that documents the decision pathway for qualification, and this plan should be provided to EPA prior to inspections. EPA approval of the plan will be necessary, and this plan will include the Confirmatory Testing Plans DOE intends to require of sites.
- The Confirmatory Testing Plan requirement should be extended to all processes except for those that use the current CH Program (e.g., 100% radioassay). This is because the DTC and DA processes are site specific and could be variable, requiring specific planning. That is, the only "standard" method would be one that uses the current CH Program.

- The characterization reconciliation report (CRR) should include all of the qualification results (we assume this to be DOE's intention), but could also document how the data will be input into the WWIS.

3. DOE has indicated that the PIP is the major implementation document for the RH program. It includes Attachments A, B, and C that provide additional guidance and criteria to sites regarding AK and DTC; similar attachments should be included addressing other characterization alternatives such as DA and less than 100% NDA. This would provide more complete guidance to sites with regard to all radioassay processes that may be considered, and would then be a document that presents the overall process, together with more specific guidance and criteria on elements of that process. We expect that the CH-WAC NDA requirements will apply to NDA of RH waste. However, if DOE intends to prepare a separate RH WAC then it should include details commensurate with the CH-WAC. EPA must receive this document for review and approval prior to the first RH waste inspection. Alternatively, if DOE intends this PIP to be implemented in place of the RH-WAC by the sites, the PIP should be revised, as indicated in this comment, to include more detailed guidance and information. See comments below, including those on Attachment A, B, and C.

Specific Comments:

PIP-1. Figures 1 and 2: The Figures 1 and 2 do not adequately represent the characterization process as explained by DOE in the February 20 conference call. For example, the second box in the flow diagram, the <Identify AK Source Documentation> box, branches to two decision boxes. Is the <Identify AK Source Documentation> box a decision box? Also, one of the decision boxes it branches to test whether it is existing data gathered under an EPA approved program. If that condition is true, the data is not AK, so it appears there is some disconnect in the Figures. Also, it is our understanding that DOE intends to assemble/assess AK information which then either would be confirmed, corroborated, subjected to peer review, or the QA-program used would be determined as equivalent to that established following the promulgation of 40 CFR 194.22 requirements. Additionally, approval of site-specific characterization plans would be necessary. We have developed a flow chart *(See EPA's RH Waste Characterization Process Flow Diagram)* that reflects both DOE's stated activities and our understanding of necessary activities, as well as additional activities and documentation.

PIP-2. Sections 2.2.2 and 2.2.3, Data Quality Objectives and Quality Assurance Objectives: The "tolerable decision errors" associated with all of the DQOs are not precise enough to guide sites in selecting appropriate waste characterization process. Sites are simply required in general, to determine the uncertainty. The tolerable decision errors should provide meaningful information, and should better justify the generalities provided therein. Also, since DOE wishes to make assumptions concerning quantities of cellulosic, plastic, and rubber (CPR) in RH waste, it is unclear why "generator sites must determine the uncertainty in the estimate of the weight of the waste"; Is it true that DOE intends to perform no weight determinations for WMPs in RH waste, except for those associated with total container weight/shipping requirements?

PIP-3. Section 2.2.2.1, Data Quality Objectives: The definition of TRU waste does not include uncertainty. However, the measurement to determine whether waste meets the definition of TRU waste does include uncertainty. In the CH program, the requirement for a lower limit of detection of 100 nCi/g, or less, for the TRU alpha concentration provides an implicit limit on the uncertainty for the determination of the TRU activity and concentration. No equivalent requirement exists for the determination of TRU activity in the RH program unless the activity is measured by NDA in accordance with the CH program rules. (This comment also applies to Section 4.1.3.2)

PIP-4. Section 2.2.2.3, Data Quality Objectives. This DQO does not include any accounting for the uncertainty in the activity measurement in order to ensure that the container does not exceed the upper limit of 23 curies per liter, as specified in the LWA. An analogous requirement to this would be the container limit of 200 fissile gram equivalent (FGE) in the CH program. A drum is considered to meet the 200 FGE limit if the derived FGE plus 2 sigma is less than 200 grams. (Note - The 200 FGE limit is a NRC transportation limit, so EPA has not been involved with regulating this in the CH program. The 23 curie per liter limit requirement is the first time EPA has had a container upper limit based on radioactivity that it must regulate; the 200 FGE limit is provided as an example of how upper limits are currently regulated in the CH program.)

PIP-5. Section 2.3, RH TRU Waste Characterization Process, page 11. *(EPA Site Specific RH Waste Characterization Process Flow Diagram).* The characterization process described in this section should be clarified, as the information is confusingly presented. DOE states:

> "Acceptable knowledge information, supplemented with information compiled during packaging, will be used to characterize RH TRU waste. In those cases where waste is already packaged in a container suitable for shipment to WIPP, a subpopulation of the waste will be examined to confirm AK information, or AK information will be qualified per section 4.3. Waste characterization methods are described in Section 4.0"

This statement infers that only previously packaged waste will undergo AK qualification, which is incongruent with statements in other sections which imply that to-be packaged waste may also be qualified. The next paragraphs imply that all waste could be qualified using one of the methods listed in 40 CFR §194.22. The next to last paragraph of this section states: "Alternatively, AK information may be confirmed using the characterization methods in Section 4.1". What is the difference between confirmation performed under 40 CFR §194.22 and this alternative approach? Is the alternative approach instead a mechanism whereby additional information will be obtained if the AK record is not amenable to §194.22? If "confirmation" is selected as a qualification method under §194.22(b), how does this relate to the required confirmation of AK shown in Figure 1? Also, statements that the sites "may" qualify data in accordance with §194.22 imply that other alternatives will be considered, but DOE did not indicate that this would be the case.

We understand that DOE sites will collect AK data for all wastes, and must qualify the data using confirmation, corroboration, peer review, or QA equivalency determination. Therefore, the

following would help clarify this position:

- The last paragraph on page 11 could indicate that AK will be assembled for all waste, and if this AK record is lacking, sites may elect to obtain missing information during packaging; if AK information indicate that the waste is not eligible for shipment to WIPP (e.g. it is non-defense in origin, etc), the waste will be segregated and not shipped to WIPP under this program. This process applies to both waste that is packaged and waste that is to-be packaged. All waste will be qualified according to §194.22(b), although the methods for confirming AK could differ for packaged and to-be-packaged waste (i.e., DTC may be selected for packaged waste, while sites may determine it appropriate to use NDA for waste that must still be packaged). If sufficient AK data are not available, additional data will be obtained. If this does not represent DOE's intent, revise accordingly.
- If there is a plan to acquire information outside of the AK process described by the DOE, then this should be clarified. We understand that, for example, data could be obtained to augment a poor AK record, but this would not preclude subsequent confirmation of the AK record as a whole (if confirmation is selected) as this information would be "looped" into the AK process that leads to the qualification activities. If DOE proposes a separate characterization activity to take place contrary to our understanding, please clarify. The statement that "Alternatively, AK information may be confirmed..." is not congruent with statements made by DOE during conference calls, wherein confirmation is a subset of the qualification process and is not an alternative.
- The definition of waste stream does not include any mention of radionuclide content. This is not an issue with the CH program since isotopic content is measured for every drum. In the RH program, for methods such as DTC to work, the group of waste containers for which the DTC modeling is being performed must have similar radiological characteristics; in particular they must have similar relative abundances of the radionuclides. Accordingly, the definition of a waste stream should include isotopic content if the basic waste grouping for DTC modeling is to be a waste stream.

PIP-6. Section 2.4.1, Payload Acceptance Criteria. The current CH program requires sites to record the ferrous and non-ferrous metal content during visual examination and RTR. While it is agreed that general ferrous metal content can be tracked by knowing the number of containers that would be present and assuming that the composition of these containers is ferrous metal, additional information is required to address the statement that metals will be "met by....average container material of construction weights". Also, the implication that the RTR and VE performed under the CH program do not track these metals is incorrect; the container and waste metal content is summed in the WWIS. Additional support for this simplification under the RH program is warranted.

PIP-7. Sections 2.4.2 and 2.4.3, Physical Properties and Physical Form Acceptance Criteria. The acceptance criterion for liquid waste appears reasonable, but it should be noted (perhaps not herein) that AK should require that relevant data to determining the presence of

liquids must be assembled. Also, the visual examination procedure must be revised to require the examination of material for the presence of liquids (i.e., inclusion of only how to deal with non-transparent containers is appropriate, but the visual examination process should also take advantage of the packaging process to ensure that no liquids are present).

Also, provide supporting information for the maximum loading density of plastic, and the specific calculations that will be performed in the WWIS. Is there ever an incidence when the actual material amount will be entered? If so, the WWIS should be able to differentiate between actual vs. calculated/assumed values. Also, soils, gravels, and solids can include up to 49% debris; clarify how the assumption that no CPR present in these wastes (other than liners) is appropriate. Also, where appropriate, link the assignment of "plastics" to CCA determinations to justify this assumption (i.e., why rubber and cellulosics are not assumed). Also, this action in truth does not track "total CPR"; the action only tracks plastics, with the assumption that rubber and plastic are not present.

(EPA Site Specific RH Waste Characterization Process Flow Diagram, Identify, Assemble and Assess AK Information) As presented in comments on Attachment A, the AK record must contain container-specific information, if available, on waste material parameters. Also, waste material parameter descriptions must explicitly be included in the AK record for each waste stream. This is required because the WWIS will include simplifications that do not reflect the actual waste content, and this information is required to ensure that the wastes are appropriately grouped and waste stream identification is adequate. In addition, revisions to the visual examination procedure (Section 4.4.1) to require more detailed information beyond the percent fill for DTC should be mandated; that is, visual examination could be used on a waste-specific basis to obtain matrix information necessary to perform DTC characterization, and the procedure must be flexible enough to allow this type of characterization if necessary.

PIP-8. Section 2.4.5, TRU Alpha Activity Concentration. Although there is no uncertainty reported in the TRU alpha activity calculation, there is an uncertainty in that value. This uncertainty must be known in order to determine the likelihood of accidentally transporting Low Level waste to the WIPP as TRU Waste. How is that uncertainty being calculated, particularly using AK information for the isotopic content determination? Also, the CCA in Section 4.3.2 states that the uncertainty for the TRU alpha activity will be reported.

PIP-9. Section 2.4.6, Radionuclide Activity. Clarify why one standard deviation is appropriate.

PIP-10. Section 3.2 and Figure 3. *(EPA Site Specific RH Waste Characterization Process Flow Diagram, Page 2, Prepare Site Specific Assessment (Certification) Plan).* The PIP commits to requiring site preparation of a QA plan that meets the requirements of the QAPD, as well as site-specific documentation that details how each of the required program elements will be performed. Currently, the site CH Program addresses EPA compliance, and site SOPs detail the activities performed under the CH Program. However, the RH Program differs from the CH Program in that site-specific characterization programs are allowed. From the discussion it is

unclear whether the Site Certification Plan would document the necessary thought process for determining how the program was developed and would justify all programmatic elements including but not limited to the specific confirmation/measurement techniques used to determine the §194.22 compliance. The EPA Flow Chart shows this as being a critical document that both describes and justifies the overall site approach to characterization, but the PIP does not describe the contents of the Certification Plan. The Certification Plan or an "Assessment Plan" should detail how the proposed pathways were selected and mechanisms by which DQOs will be assessed. In addition, DOE should mandate a specific assessment methodology by which sites would assess the AK data and determine the appropriate method for qualifying that information. A "DQO"-type approach would be useful guidance to sites for assessing this information; regardless, DOE must provide in the PIP detailed, specific, and consistent guidance to sites on how to assess information and select a path forward so that consistent and defensible decisions are made.

PIP-11. Figure 3. *(EPA Site Specific RH Waste Characterization Process Flow Diagram, Page 2, Prepare Site Specific Assessment (Certification) Plan).* Waste-specific sampling/analysis/measurement plans (i.e. Site Analysis Plans) must be developed for each confirmation activity performed, except in the case where 100% NDA is determined. This plan should be reviewed and approved by CBFO/EPA prior to implementation, as the Certification and/or "Assessment" Plan should be.

PIP-12. Section 3.3, Assessment and Oversight. No changes to this section are suggested at this time. EPA will perform independent inspections for each generator site producing and/or managing RH waste to assess compliance with the WIPP Certification Decision, and prior to these inspections EPA will conduct a much more rigorous pre-inspection review of the site documentations including Certification or "Assessment" Plan, Confirmatory Testing Plans, and SOPs. EPA may request additional information from a site, if necessary. Only once the "Assessment" Plan and Confirmatory Testing Plans meet EPA's approval would EPA perform an inspection; this is required because the DOE has chosen to not implement a prescriptive program in it's RH Proposal, instead opting to assess the detail on a site and even waste-specific level. To ensure that the appropriate program is in place, EPA must perform this site and/or waste-specific assessment prior to inspection.

PIP-13. Section 3.4, Waste Characterization Tracking and Control. The PIP should specify the fields that will be filled as part of the WWIS, and specifically how information entered into the WWIS will be determined or reference where this determination is made. This is important because fields that are filled would be based on assumptions for waste components of container type (i.e., CPR, metals). Also, EPA has always emphasized that measurement data must be entered into the WWIS; under the RH program it is possible that measurement data will not be available for every container, requiring extrapolation or derivation of containers with no measurement data. The PIP should contain a procedure(s) showing how extrapolation or derivation of container-specific measurement data from limited container data can be achieved. In addition, it is possible that sites would elect to use AK information if measurement data "confirmed" AK. In short, the PIP should address, somewhere, how sites will determine "which"

data to enter into the WWIS based on the confirmation system used. Alternatively, DOE could require that the site to include these steps in site-specific documentation that would be assessed by EPA prior to inspection, or it could be included in the CRR which would be assessed during inspection.

PIP-14. Section 3.5, Data Management *(See EPA DA Chart 1, Bullets 5-17 regarding management of data; DA Chart (continued) All Decision Boxes and all but the first two Process Boxes (sample collection and analysis)* The current version of the Data Management section does not detail how validation/verification activities and reconciliation activities will be performed and does not indicate how DOE intends to resolve nonconforming data. DOE should define data management criteria that allow the sites to ensure the quality of characterization data and to ensure that characterization data is appropriately used in making characterization decisions. DOE should provide further definition and/or clarification for the elements of Data Management to include but not intended to be limited to:

- DOE should specify criteria and/or develop a strategy to define what actions must take place and what criteria must be met to reconcile confirmation/measurement characterization data with characterization information acquired through the AK process, to ensure that consistent evaluation of this information occurs at generator sites.
- DOE should define the statistical process that will be used to reconcile the DQOs. Specifically, DOE should define mechanisms for determining if an appropriate number of samples were taken based upon the actual characterization data that were collected; and if those data were properly identified and transformed if necessary.
- DOE should specify criteria for the validation of different radioassay sampling, preparation, and analysis activities. DOE should outline criteria for collecting representative samples within a waste container and from the population of waste containers for a waste stream. DOE should define justifiable, method-specific frequency and quality control limits that allow for the assessment of precision and accuracy QAOs. DOE should also define method-specific calibration acceptance criteria as well as minimum levels of detection for each isotope. Definition of these criteria will be beneficial in allowing sites to select appropriate preparation and analytical methods based upon their own site-specific analytical capabilities.
- DOE should provide levels of review for RH waste characterization activities similar to those for CH activities, making RH waste characterization data reviews consistent with other characterization activities already performed by DOE. Currently, CH characterization activities require independent technical review, technical supervisory review, data generation level quality assurance review, site QAO review, and SPM review. Additionally, the review responsibilities at each step of the review process should be identified and documented in a review-specific validation checklist.
- Because the reconciliation process could involve fairly sophisticated statistical evaluation, the DOE should define qualification and proficiency requirements for the individuals performing the evaluation. The individual should have adequate experience, training, and technical skills to perform all of the activities that would be required in assessing characterization data.

- DOE should indicate how waste containers in waste streams that do not have adequate characterization data will be managed, and this should be documented as part of data management. DOE must implement procedures that will ensure that waste containers are not inadvertently shipped to WIPP without adequate characterization data.
- DOE should reference or indicate appropriate performance standards, quality control measures, validation criteria, and QAO assessment activities for all of the measurement and testing activities that will be performed.
- DOE should clearly define actions or data quality conditions that would constitute a nonconformance.
- Criteria should be established that CBFO can use to assess the adequacy of sample collection and preparation methods which are critical for establishing that representative samples were collected and that all necessary radiochemical separations and preparations were performed correctly. Additionally, analytical method-specific QC analyses, frequencies, and limits should be defined and justified to ensure that the quality of analytical data can be adequately evaluated.

PIP-15, Section 4.1, Characterization Methods. Section 4.1 states that "The primary [characterization] method is to collect needed information as waste is packaged. Generator sites may propose to qualify AK information as waste characterization data . . ." This implies that AK data need not be collected as a "primary characterization" step and that the characterization process includes activities separate from the §194.22(b) qualification process. Put another way, it implies that sites may elect *not* to collect AK information, but may propose collection of primary data using a program "parallel" to the one described to use in the conference call (i.e. AK data collection, assessment of this information, qualification, etc). It is assumed that this language is perhaps an "hold over" from previous PIPs that included the CTP process. DOE should modify this paragraph to present the intended characterization routes. We assume that while collecting the AK data, sites will take advantage of the packaging process to collect information necessary to augment a poor AK record if necessary, or to acquire confirmation data as part of the qualification process.

PIP-16. Section 4.1.1.1, VE Method. The VE method does not include any requirement to estimate CPR using VE records, weight tables, or other "simple" methods, nor does it include any method to confirm these estimates. We assume that this is because DOE wishes to rely on assumed values rather than actually examining and/or measuring RH waste to obtain real values. However, the VE Method should not limit the potential need to obtain information of this nature, particularly if measurement requires more data than percent fill or "primarily concrete, etc" to accurately measure waste. The VE method should include a step that allows the examination and potential measurement of CPR as needed by other characterization methods (e.g., DTC and DA). Additionally, the "description of container contents" should include a description of the waste material parameters present, primarily to ensure that the waste "matches" the waste stream as designated through AK. Also, the VE method should include the determination of whether the waste contains liquids; experience with the CH program has shown that AK alone cannot determine the presence of liquids in wastes on a container basis, and the liquid limitation is presented and considered a payload container limitation.

PIP-17. Section 4.1.1.2, VE Training. DOE proposes to identify waste by Summary Waste Category Group (SCG), not by Waste Matrix Code (WMC) as is currently done under the CH program. Assignment of WMCs can sometimes be problematic, but this system (or one like it) has compelled sites to examine their AK information to truly understand it's contents and, therefore, linkages to AK processes. The VE process should include identification of waste material parameters (WMPs) important to EPA, not just summary category groupings, and personnel should be trained to recognize WMPs.

PIP-18. Section 4.1.1.3, Quality Assurance Objectives. Specify the criteria under which VE records would not be included in or referenced by the AK record. Under the current CH program, VE records are available to AK personnel and any reconciliation as a result of VE is presented in the AK Summary. The RH plan states "VE is used to identify or confirm waste parameters, including the absence of residual liquids in excess of one percent and physical form". This statement implies that the RH and CH program have similar uses with respect to VE, and requires clearer statement, including the areas of record management. Site plans to qualify VE data are appropriate, but does this qualification also extend to RTR or other methods? We assume this statement was included to address the use of VE data for already-packaged waste. In this case, the provision of a plan is appropriate and this information should certainly be included in the AK record.

PIP-19. Section 4.1.2 Acceptable Knowledge, pages 27 and 28. *(EPA Site-Specific RH Waste Characterization Process Flow Diagram)* The PIP does not clearly state that the first step to the characterization process is to assemble AK information. As written, the assembly of AK information can be construed as arbitrary, and this contradicts statements made elsewhere in the RH Proposal. The AK description must include not only the Summary Category Group, but the specific waste material parameters within waste streams. The AK Summary Report documentation need not be exhaustive, but as the DOE expects more reliance on the AK for RH waste characterization, the AK record must be auditable and sufficiently robust to justify all designations and to allow EPA inspectors to completely understand statements and assignments within the AK Summary. Also, with respect to radiological information, the amount and quality of these data must be clearly presented. In addition, because the RH program relies on AK so heavily (more so than the CH program), the RH program must specifically require that site assemble and assess all container-specific data pertaining to both radionuclides and waste material parameters. This information should be assembled on spreadsheets or similar presentation formats, and should be evaluated and assessed in the AK Summary. Also, radioassay personnel should be involved in the AK data assembly and evaluation process to ensure appropriate data evaluation—for example, information concerning solid waste heterogeneity and other aspects important to supporting destructive assay must be recorded. All supporting spreadsheets and copies of container-specific AK data should be in the AK record, or adequately referenced so that during the EPA inspections, inspectors can readily obtain and examine the information. Inclusion of this information is necessary, because it will be an important element of our review when assessing whether the appropriate decisions were made with regard to pursuing confirmation or peer review, or perhaps identifying data gaps in the AK

record that mandate acquisition of additional support information before any §194.22 qualification can occur. Also, experience in the CH program has shown that the AK record cannot identify the presence of residual liquids requiring the rigorous approach to assessing liquid presence as part of the AK exercise.

Also, inconsistencies in documentation must be addressed. For example, the document states on page 28: "Acceptable knowledge information that is relied upon to satisfy DQOs....must be qualified in accordance with Section 4.3 or confirmed using the characterization methods as described in Section 4.2". As written, this statement implies that sites have the option of NOT using any AK information to obtain DQO data; this can be obtained through separate measurement or examination. This is also confusing because qualification *includes* confirmation, so DOE needs to clarify whether the listing of confirmation alternatives (i.e. 100% NDA or DRC, DA , and/or analysis of a minimum of 10 samples to confirm isotopic ratios, 100% VE or 10-10-All of repackaged waste) applies to confirmation as part of qualification or confirmation that is *separate* from qualification. Also, section 4.3 states that there are "standard confirmation methods", and cites Section 4.1.2 for this information; this section includes a list of methods, but does not state that these are "standard" methods that DOE will accept without further justification through provision of a plan. The following changes could be made to help clarify this section:

- State whether AK information serves as the basis for characterization and whether sites may choose to qualify this information based on peer review, confirmation, corroborating data, or an equivalent QA program demonstrations as allowed under 40 CFR §194.22(b). If confirmation is selected, the following options could be considered:
  - Radiological:
    - 100% NDA
    - DTC of containers with radioassay of representative waste samples to confirm isotopic ratios
    - DA of homogenous solids
    - Other
  - Physical/Chemical:
    - 100% VE
    - VE of a subpopulation
    - Radiography
    - Other

- We recognize that these methods could be used to obtain data to augment the AK information, but these would not be considered "confirmatory". If that is true, we assume that the "augmented" record would then be subject to qualification, and that the new AK information obtained would have been done under an equivalent QA program, and therefore, DQOs addressed by this information would not require further sampling/confirmation. Alternatively, is there a separate characterization program that could be implemented unrelated to AK? Clarify. DTC, DA and various combinations thereof (i.e. "Other") require site-specific considerations with respect to obtaining

representative waste samples, etc, and these cannot be considered "standard" approaches that do not require a Confirmatory Testing Plan. Only characterization approaches that require 100% NDA and 100% VE/RTR commensurate with the CH Program are "standard."

PIP-20. Section 4.1.2.2, Quality Assurance Objectives. DOE should revise accuracy objectives to include complete assessment regarding waste stream descriptions (see comments pertaining to identification of waste material parameters and other more detailed assessments) and radiological components. Also, the AK accuracy QAO, as well as the other AK QAOs, does not address radiological properties or process knowledge related to the generation of radionuclides, although the compilation of radiological AK information is required (See Section 4.2.2.1, Page 28) and will be used as part of the DTC method to derive activities of radionuclides.

PIP-21. Section 4.1.3, Dose-to-Curie Conversion, Page 29. The WCPIP asserts that DTC can be used to establish radiological characteristics "when used in conjunction with adequate AK information." While the nature of such AK can be inferred from the discussions in Attachment C regarding modeling, to the extent practical, the PIP should identify the type of AK information required for the DTC method, either in this section or in the AK section.

PIP-22. Section 4.1.3.1, Dose to Curie Conversion Method, Page 30, 2nd paragraph. The last sentence of this paragraph really is the essential requirement. The system should not contain an assumption of data applicability, but rather, this should be demonstrated for each sampling program.

PIP-23. Section 4.1.3.1, Dose to Curie Conversion Method, Page 30. According to the WCPIP, "[w]hen sites designate waste streams, they will be required to determine the applicability of the DTC method and sampling analysis required to determine conversion factors." This requirement is important to assuring that the DTC method, if used, is used appropriately, but the WCPIP, including Attachment C, provide little specific guidance or criteria to the generator sites for determining the applicability of the DTC method.

PIP-24. Section 4.1.3.1, Dose-to-Conversion Method, Page 30. This section requires that when "smears and swipes are used for determining radionuclide distribution, the generator site must demonstrate that sampling does not bias the results (i.e. removable contamination has similar radionuclide distribution when compared to fixed contamination)." This requirement that sites demonstrate the appropriateness of using data from swipes or smears is important to assuring that the correct radionuclide ratios are used, if and when they are appropriate. It should be remembered that the purpose of such swipes was to expressly detect the presence of removable contamination only, and that such swipes were never intended for the uses described in the WCPIP. Actual waste samples, therefore, must be included when determining radionuclide distribution. The section should discuss what is the minimum number of waste samples that must be taken and the basis for the minimum number.

PIP-25. Section 4.1.3.2, Quality Assurance Objectives, Page 30. Does this section define the QAO's for any measurement/analysis work being performed on the samples that feed the DTC analysis (or are the ones in 4.1.5.2 applicable to lab work done under the DTC process)? The precision and accuracy QAO's provided here are only for the dose rate meter. QAO's should either be provided for each of the components in the DTC method (i.e. sampling, modeling, shielding calculations, dose rate measurement), or QAO's should be developed for the DTC method as a whole.

PIP-26. Section 4.1.3.2, Quality Assurance Objectives, Page 30. The requirement that the lower limit of detection (LLD) or reporting threshold be derived for all radionuclides is a requirement in the existing CH program. The CH program also has a requirement that NDA systems used to sort TRU waste from low level waste (LLW) have a detection limit (sometimes referred to as the minimum detectable concentration or MDC) of 100 nanocuries of TRU alpha activity per gram of waste. This requirement provides an implicit limit on uncertainty and objective evidence that NDA systems can discriminate LLW and TRU waste. No similar requirement is provided for DTC, even though DTC could be used to classify/identify waste as TRU or LLW.

PIP- 27. Section 4.1.3.2, Quality Assurance Objectives, Page 30. The last requirement here states that TMU will be determined for the DTC method. If isotopic quantities are determined via DTC, is the TMU calculated for the DTC uncertainty and will that uncertainty be applied to the TRU alpha concentration for the TRU/LLW decision?

PIP-28. Section 4.1.3.2, Quality Assurance Objectives, Page 30. Note that this section requires sites to confirm AK information related to radionuclide distributions by sampling in order to meet a Representativeness QAO for DTC.

PIP-29. Section 4.1.4.1, Radiography Method, Page 31. The attenuation of x-rays through a matrix, the basis of radiography, depends on the effective atomic number of the material, the density of the material, and the energy of the x-rays. To say that "[x]-rays are a direct measure of the material density" is something of a simplification.

PIP-30. Section 4.1.5, Radioassay, Page 34. This section describes the requirements for the use of radioassay, including both nondestructive assay and destructive assay, to characterize the radiological properties of the waste. The requirements presented are nearly identical to those for the characterization of CH waste. One notable exception is the lack of a Performance Demonstration Program (PDP) for the characterization of RH waste.

PIP-31. Section 4.1.5.2, Destructive Assay (Radiochemistry). Criteria for destructive assay sampling and analyses activities should be defined. The PIP should contain adequate detail to establish a framework for a site-specific destructive assay program and the performance criteria. The following specific elements should be assessed and criteria provided in the PIP:

- Provide guidance to ensure that representative destructive assay samples are collected.

We expect that the criteria for collecting a representative sample in the soil/gravel waste summary category would be different than the criteria used to collect a representative sample in the homogenous solids waste summary category. Factors that should be considered in establishing criteria for collection of representative samples include:

- Stratification based upon physical or chemical properties of the waste.
- Different waste components in debris wastes.
- Random containers are selected for sampling and that randomness of sampling locations within a waste container is established.

- Identify the types of analytical methods that could be used to determine isotopic ratios, elemental concentrations, gross radioactivity, or isotope specific activities. For example, when conducting DA to obtain radionuclide specific isotope values, the types of analytical method/sampling techniques that can be used determine activities for each isotope of interest to EPA should be presented.
- Provide criteria for sample preparation and analytical activities to ensure that proper chemical separations have occurred, that samples are in the correct geometry, and that adequate quality control and calibration verification tests have been performed.
- Provide acceptance criteria/frequency for collection of field duplicates, field blanks, and other potential field QC samples. Radioisotopes included in matrix spike(s) (MS) as well as laboratory Control Sample (LCS) QC samples should be established, as the LCS and MS for each method may be different dependant upon the isotopes of interest in each method. Additionally, minimum criteria for standard traceability to standardized sources should be established. Method specific criteria for conducting and accepting initial calibration and calibration check samples should be defined and justified. Calibration criteria should include identification of minimum frequencies of initial calibration and analysis of check standard samples; and definition of calibration acceptance criteria. Also, justification for duplicates, LCS, and MS control limits should be included.
- Indicate how uncertainty values would be accounted for when performing statistical calculations for determining the waste stream mean activities for the entirety of the sampling effort, also indicating how activity and uncertainty values will be accounted for in all sampling statistics.
- Criteria for assessing blanks that will be applicable to all sites should be presented.
- Define minimum isotope-specific detection limits. These minimum detection limits will often serve as a driver for establishing which method could be used to analyze each isotope. Additionally, criteria for use of data reported below the detection limit and management of non-detected result used in sample statistics should be provided.
- Provide validation criteria for assessing DA results, including those for calibration, method blank, LCS, MS, and yield. Additionally, DOE should specify requirements for calculation verification, standard traceability that should be assessed during the validation process.

PIP-32. Section 4.1.6, Surface Dose Rate, Page 42. This section describes the requirements to measure the surface dose rate to insure that the waste meets the definition of RH waste. Note that Section 4.1.6.1 requires the measurement of dose rate *equivalent* due to beta, gamma, and

neutron radiation. The measurement of neutron dose rate equivalent may require a separate dose rate meter, and the total dose rate would have to be calculated by summing the beta/gamma dose rate equivalent and the neutron dose rate equivalent.

PIP-33. Section 4.2, Implementation of Characterization Methods to Satisfy DQOs, Page 43. Should the fourth line of Section 4.2 refer to the requirements of the LWA and the *EPA*?

PIP-34. Section 4.2, Implementation of Characterization Methods to Satisfy DQOs. As written the PIP implies that several different options may be considered by sites to satisfy DQOs. However, none of the options describes the criteria to select a specific option -- it does not provide guidance with regard to selection of each of the options. Is DTC an AK qualification method under confirmation? Presentation of, for example, AK Qualification, DTC, DA, and NDA as "stand alone" methods implies that a parallel program *outside* of the AK qualification pathway would occur. However, DOE indicated that this is not the case in the recent conference call to address EPA questions on the RH Proposal. (*EPA's Site Specific RH Waste Characterization Process Flow Chart* shows the possibility of data collection before AK qualification). The document could be clarified to state that the methods under each are the confirmation techniques that could be considered under §194.22, and the "AK qualification" discussion refers to other qualification options (i.e., peer review). We assume that any of these methods could be used to augment the AK record "prior" to qualification.

PIP- 35. Section 4.3 Qualification of AK Information. DOE believes that some AK information is of sufficient quality that no measurement data need be collected, and Peer Review and qualification of AK programs would allows this. Section 4.3.3 deals with confirmation of AK data as part of the §194.22 qualification process, but this should be revised to address issues previously raised about the list of "standard" methods and to address pertinent issues presented in comments on Section 4.1.

Attachment A

AA-1. Section 5.2. Because RH AK may not be confirmed as robustly as CH AK, the RH AK record must be more thorough and complete. DOE must ensure that the AK record includes all drum or container-specific data that are available, and this information must be thoroughly assessed and summarized in the AK Summary Report. Specifically, the AK record must include all container-specific data regarding radionuclide information that could support any of the DQOs, and must include container-specific data related to waste material parameters present in each container. Additionally, container-specific information pertaining to liquid content must be assembled. This information should be presented on a spread sheet or similar documentation format, and should be assessed and summarized in the AK Summary. All information should be included in the AK record, or should be readily available to the AKE and EPA inspectors. A listing of containers with specific data, and the types of data available, would also be useful. If this information is not available, the AK Summary should so state.

AA-2. Section 5.6. Sites are allowed to apply the most conservative characteristics to the waste

stream if there is conflicting information, but the section goes on to state that if discrepancies cannot be solved, waste cannot be shipped to WIPP. This appears to provide conflicting guidance. Also note that the definition of waste stream does not explicitly include grouping by radionuclides as the selection of confirmation techniques depends on knowing radiological characteristics.

AA-3. Section 6.2. This section of the AK Procedure states that if sites believe they have information sufficient to qualify AK information, this route (i.e., peer review, QA program equivalency, confirmation) may be selected. Otherwise, sites must collect additional radionuclide information during packaging, including information to support dose to curie use. Is this additional information collection activity considered another AK "confirmation", or is this collection of data separate from AK that would be a "stand alone" determination of the specific DQO? We assume that the information would be collected and integrated into the AK record, at which time a qualification determination approach would be made. Also, we assume that DOE may choose to qualify the information collected to augment the AK record using a demonstration of equivalent QA program, or other qualification method, so that confirmation of that DQO would not be required. However, EPA would scrutinize this data collection activity for technical adequacy and appropriateness, in the same fashion and level or rigor that it would use to examine confirmation activities.

AA-4. Section 6.3. AK must go beyond collection of simple Summary Category Group information to be meaningful. Specifically, AK must also collect waste material parameter information and summarize this information in the AK record.

AA-5. Section 6.4. Our experience in the CH AK program has shown that AK records often tell little regarding the presence of residual liquids, regardless of whether removal or non inclusion of liquids was proceduralized. The AK record should specifically include detailed, container-specific information that supports the absence of liquids.

AA-6. Section 8.0 The AK Procedure says the SPM is responsible for resolving discrepancies between the AK record and confirmatory test results. However, are these "confirmatory test results" those associated with AK qualification, or does this include information obtained through sampling/analysis, measurement, and/or modeling that is obtained outside of the qualification program when AK is inadequate? As stated previously, the use of the term "confirmation" is confusing, as the data collected outside of the qualification program is presumably not "confirmation", but would still need to be examined and assessed within the AK record as a whole. Also see comment IP-12. We agree that the CRR can be used to "bring all the information together".

AA-7. Section 9.0. Identify and justify any and all differences between the CH Waste Stream Profile Form (WSPF) and RH WSPF.

AA-8 Attachment 1- AK Summary Report. The AK Procedure makes no mention of Supplemental Waste Stream Information, but this is included as a subsection in the AK Summary

Report. Also, the section on "container specific information" has been used under the CCP to discuss the actual waste containers (i.e. types of drums) waste are placed in, but this section could also include container-specific data and related summaries with respect to radionuclide information, etc; at least reference where these data are included in the auditable record.

Attachments B and C

AB-1. Attachment B This is a step-by-step procedure to perform the dose rate measurements and associated calculations for the DTC method. The level of detail is typical of that found in standard operating procedures (SOP) written by the generator sites. Presumably, the sites would use Attachment B as is or would incorporate it into their own procedures.

AC-1. Attachment C, General Procedure for DTC Estimation. The modeling codes for the process, such as QAD-CGGP and ORIGEN, are prescribed in the document. Will DOE allow other models or methods? (Note: This comment is also applicable to Revision 7.) EPA will evaluate these methods as part of the site inspection process.

AC-2. Page 87. The definition of RH waste is given as waste having an *exposure rate* greater than 200 *mR*/hour, instead of waste with a *dose rate* equal to or greater than 200 *mrem*/hour. (See Section 2.2.2.2) A milliroetgen (mR) is usually assumed to be 1 millrem (mrem) for gamma radiation, making the two definitions approximately equivalent when the neutron dose is negligible. (See also Comment AC-14.)

AC-3. Page 88. Attachment C states that "[s]amples of the waste or of representative contamination on or within the waste pieces will be obtained from each waste stream. "Smear" or "swipe" samples, obtained for health physics purposes, can be analyzed for waste characterization if the removable contamination is representative of the overall contamination in the waste. (Note: The use of smears or swipe samples are not explicitly addressed in Revision 7. However, more requirements for representativeness of samples are included.)

AC-4. Page 91. The WCPIP asserts that "[r]adiation fields up to 500 R/hr, 500 rads/hr, 5 gy/hr should be able to be measured." Also, dose rate meters used must be capable of accurately measuring radiation fields at lower ranges, such as ranges that include the 200 mrem/hour limit between CH waste and RH waste.

AC-5. Page 91. In Table 1, ^{233}U is listed as a "TRU" radionuclide. ^{233}U is an artificially produced alpha emitter with a half-life greater than 20 years (The half-life of ^{233}U is 1.592×10^5 years). However, ^{233}U is not transuranic radioisotope. Based on the performance assessment supporting the Compliance Certification Application, this isotope was identified as the radionuclide of concern requiring its identification, quantification, and tracking in the WIPP Waste Information System. The Land Withdrawal Act (LWA) defines the term "transuranic waste" as "waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years..." (See also Sec. 2(18) of the LWA and

Comment AC-18.)

AC-6. Page 92. Attachment C states that "[t]he "swipe" or "smear" samples are of non-fixed contamination on the surface of waste, equipment, and facilities." This proposed method of using swipes may be most appropriate when characterizing contaminated equipment, clothing, or other items that were likely to be contaminated by the same source material that contaminated the surface being swiped. Sites should demonstrate that contamination, fixed and removable, is representative of the waste being characterized and not just the contamination in the area of operation, particularly in cases where the waste is something other than contaminated debris. Whenever possible, samples of the waste itself should be analyzed, and the requirement to demonstrate that removable contamination has similar radionuclide distribution when compared to fixed contamination should apply to both historical data and representative waste samples taken to determine isotopic ratios. (Note: This comment is still applicable in general, although the use of swipe or smear measurements is not explicitly discussed in Revision 7.)

AC- 7. Page 94. Attachment C states that "[t]he method of determining the activity of individual isotopes in the "Standard Mix" actually measures activity of the isotope relative to a unit activity of Cs-137 (i.e., 1 mCi). For this reason we refer to *ratioed activities* of individual isotopes in the discussion below." The measured dose rate or exposure rate is a measure of the dose due to all the radionuclides in the container, with the realization that the contribution of each radionuclide depends on its activity, the type and energy of its emitted radiations (including gamma-rays emitted by progeny), and the shielding of emitted radiations by the container and the waste itself. The activities of individual radionuclides can be related to a selected radionuclide only after the activity of the selected radionuclide is determined from the measured dose and the radionuclide ratios, corrected for the detector response and matrix/container self-shielding. (Note: This comment is also applicable to Revision 7, Page 11.)

AC-8. Page 94. The argument that "an isotope's aggregate activity has variance (the squared standard deviation) equal to the variance in that isotope's ratioed activity of any given item divided by the number of items being aggregated (i.e., in the container)" is not well supported. The PIP argues that the radionuclide ratios are constant within a waste stream. If this is the case, the number of items wouldn't seem to be relevant. If the radionuclides ratios are constant, the variance in the estimated ratios would appear to be dependent on the uncertainty of the sample measurements and/or the uncertainty of input parameters such as the fuel-type and enrichment, irradiation times, etc. (See also Comment AC-21.)

AC-9. Pages 96 and 97. In Tables 3 and 5, individual radionuclide ratios for ^{239}Pu and ^{240}Pu are not given. Instead a combined value is provided. DOE is proposing to report a combined activity for the two isotopes. This is not acceptable. Reporting requirements for contact-handled waste should include requirements to report individual activities for ^{239}Pu and ^{240}Pu. (See also Comment AC-22.)

AC-10. Page 98. Attachment C states that "[d]ose rate levels are determined by measuring the Cs-137 activity using a gamma radiation detector (ion chamber) held at two locations a distance

of one meter from the centerline of the waste container being examined." This statement is somewhat misleading. As noted above the measured dose rate is due to all the radionuclides in the container. Ion chambers and other similar dose rate meters can not measure the dose rate of one radionuclide in the presence of one or more radionuclides that emit detectable radiations in significant quantities (i.e., ^{60}Co). (Note: This comment is also applicable to Revision 7, Page 14.)

AC-11. Page 103. The relative uncertainty in the inventory for ^{60}Co is estimated in the example given in theWCPIP to be 110%. Since ^{60}Co can contribute significantly to the measured dose rate, its effect on the measurement of the dose rate should be addressed in more detail. (This comment is applicable in general to Revision 7 as well.)

AC-12. Revision 7. The DTC method described in the PIP relies on acceptable knowledge (AK) and would require extensive information about the generation of the waste. For example, definitions of waste streams would be important to the quantification of radionuclides in a way that doesn't presently exist in the characterization of CH waste. The DTC method would require detailed information about the generation of the waste, such as reactor fuel types and enrichments, irradiation times, neutron fluxes, etc.

If DTC is to provide defensible quantitative information about radionuclides for WIPP purposes, the following factors must be estimated:

- The ratio of the activities of individual radionuclides to a selected radionuclide or the total activity, including at a minimum the ten WIPP-tracked radionuclides (^{90}Sr, ^{137}Cs, ^{233}U, ^{234}U, ^{238}U, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, and ^{241}Am) and anyradionuclide that might contribute significantly to the detector (i.e., ^{60}Co). The PIP refers to this as the "Standard Mix" and proposes to estimate these ratios using a combination of modeling (i.e. ORIGEN) and analysis of representative samples.
- The estimated, or calculated, dose rate at a fixed distance per unit activity of the "Standard Mix." The PIP proposes to estimate this using computer modeling (i.e. QAD-CGGP).
- The measured dose rate at the same fixed distance used in modeling the dose rate per unit activity of the "Standard Mix." The PIP proposes to measure the dose rate with standard remote-reading dose rate instruments.

Each of the above components is essential to the DTC, and the accuracy of the final activities and any derived quantities depends on the accuracy of each individual component. For this reason, the calculations and measurements above, and any other intermediate calculations or results should be considered quality affecting and should be performed in accordance with the requirements of 40 CFR 194, and all applicable quality assurance requirements. Likewise, QAOs should be developed for all of the above-mentioned components of the DTC, not just the measurement of the dose rate.

AC-13. Revision 7, Page 1. The definition of TRU waste given in the first paragraph includes all radionuclides with atomic numbers greater than uranium and half-lives greater than 20 years

instead of the definition given in Section 2(18) of the Land Withdrawal Act (LWA) of "waste containing more than 100 nanocuries of *alpha-emitting* [emphasis added] transuranic isotopes per gram of waste, with half-lives greater than 20 years."

AC-14. Revision 7, Page 1. The definition of RH TRU is given as waste that will have exposure rates greater than 200 *mR*/hr at the surface of the container, instead of "transuranic waste with a surface dose rate of 200 *millirem* [emphasis added] per hour or greater," as specified Section 2(12) of the LWA. An exposure rate of 1 mR/hour produces about 0.95 mrem/hour of absorbed dose in tissue.

AC-15, Revision 7, Page 2. In describing the loading of waste containers, Attachment C emphasizes that relatively small pieces of like-type material should be packed in a homogenous fashion. It should also be emphasized that the waste pieces in a container should have the same relative abundances of radionuclides. In general the DTC method depends, in part, on the ability of the generating site to pack waste from well-defined waste streams in a homogeneous fashion. For this purpose waste streams are waste material generated from a single process or activity that is similar in material, physical form, isotopic make-up, and hazardous constituents.

AC-16, Revision 7, Page 3. Sampling plans should be developed in accordance with appropriate EPA guidance documents.

AC-17. Revision 7, Page 6. The second paragraph states that "[s]ecurity classification issues shall be taken into account in setting up the ORIGEN runs." While the information necessary to estimate the appropriate macroscopic cross sections is likely to contain some classified information regarding the design of the production reactors used to generate the waste, it is unclear how such classification issues would impact the modeling of the radionuclide ratios, and further information is necessary to assess the impact of any limitations on EPA's ability to determine that the DTC method is being applied in technically sound and defensible way.

AC-18. Revision 7, Page 8. In Table 1, ^{233}U is listed as a "TRU" radionuclide. Like TRU radionuclides, 233U is an artificially produced alpha emitter with a half-life greater than 20 years (The half-life of ^{233}U is 1.592×10^5 years). However, ^{233}U is not transuranic radioisotope. Based on the performance assessment supporting the Compliance Certification Application, this isotope was identified as the radionuclide of concern requiring its identification, quantification, and tracking in the WIPP Waste Information System. Section 2(18) of the Land Withdrawal Act (LWA) defines the term "transuranic waste" as "waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years..."

AC-19. Revision 7, Page 10. The statement in the first full paragraph that the "exposure rate is a direct measure of the various energies of gamma rays emitted during the radioactive decay of the radionuclides in the waste" could be interpreted to mean that ionization chambers used to measure the exposure rate are capable of providing spectroscopic information similar to a solid state detector, such as a high purity germanium (HPGe) crystal. The exposure rate is actually a measure of the charge produced in air by a radiation field and is dependent on both the energy the

gamma-rays and the intensity (sometimes referred to as the flux) of the field.

AC-20. Revision 7, Page 10. The two dose rate measurements described as "12 and 6 o'clock" are made at *180* degrees and not *90* degrees as stated in the second bullet on page 10.

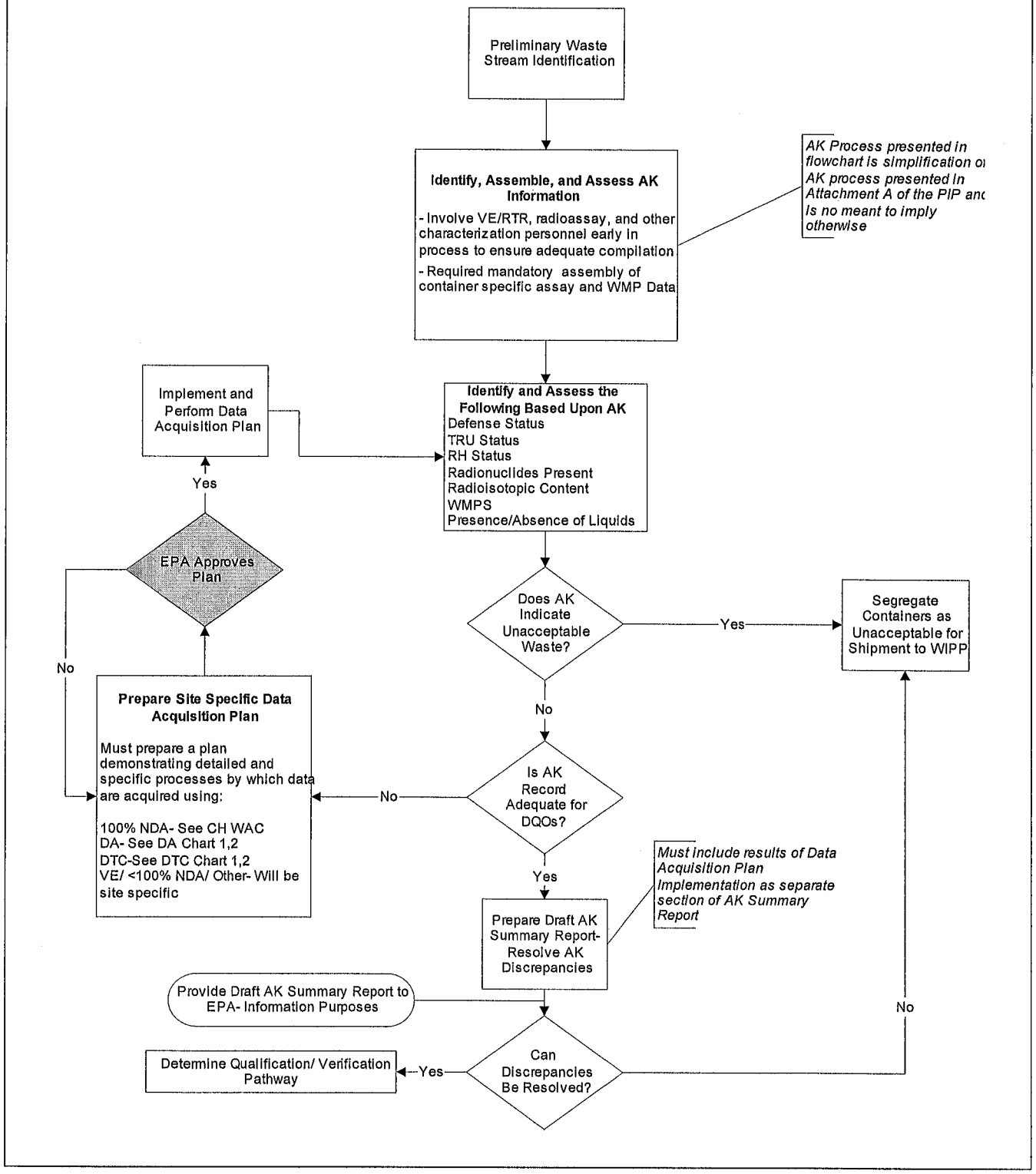
AC-21. Revision 7, Page 13. The argument that "an isotope's aggregate activity has variance (the squared standard deviation) equal to the variance in that isotope's ratioed activity of any given item divided by the number of items being aggregated (i.e., in the container)" is not well supported and requires further explanation. The DTC methodology is based in part on the premise that containers in a given waste stream have the same relative abundances of radionuclides. If this is the case, the number of items wouldn't seem to be relevant. If the radionuclides ratios are constant, the variance in the estimated ratios appeared to be dependent on the uncertainty of the sample measurements and/or the uncertainty of input parameters such as the fuel-type and enrichment, irradiation times, etc.

AC-22. Revision 7, Pages 13 and 14. In Tables 3 and 5, individual radionuclide ratios for ^{239}Pu and ^{240}Pu are not given. Instead a combined value is provided. Reporting requirements for contact handled waste, and the Section 4.2.1 of the proposed WCPIP should require sites to report individual activities for ^{239}Pu and ^{240}Pu.

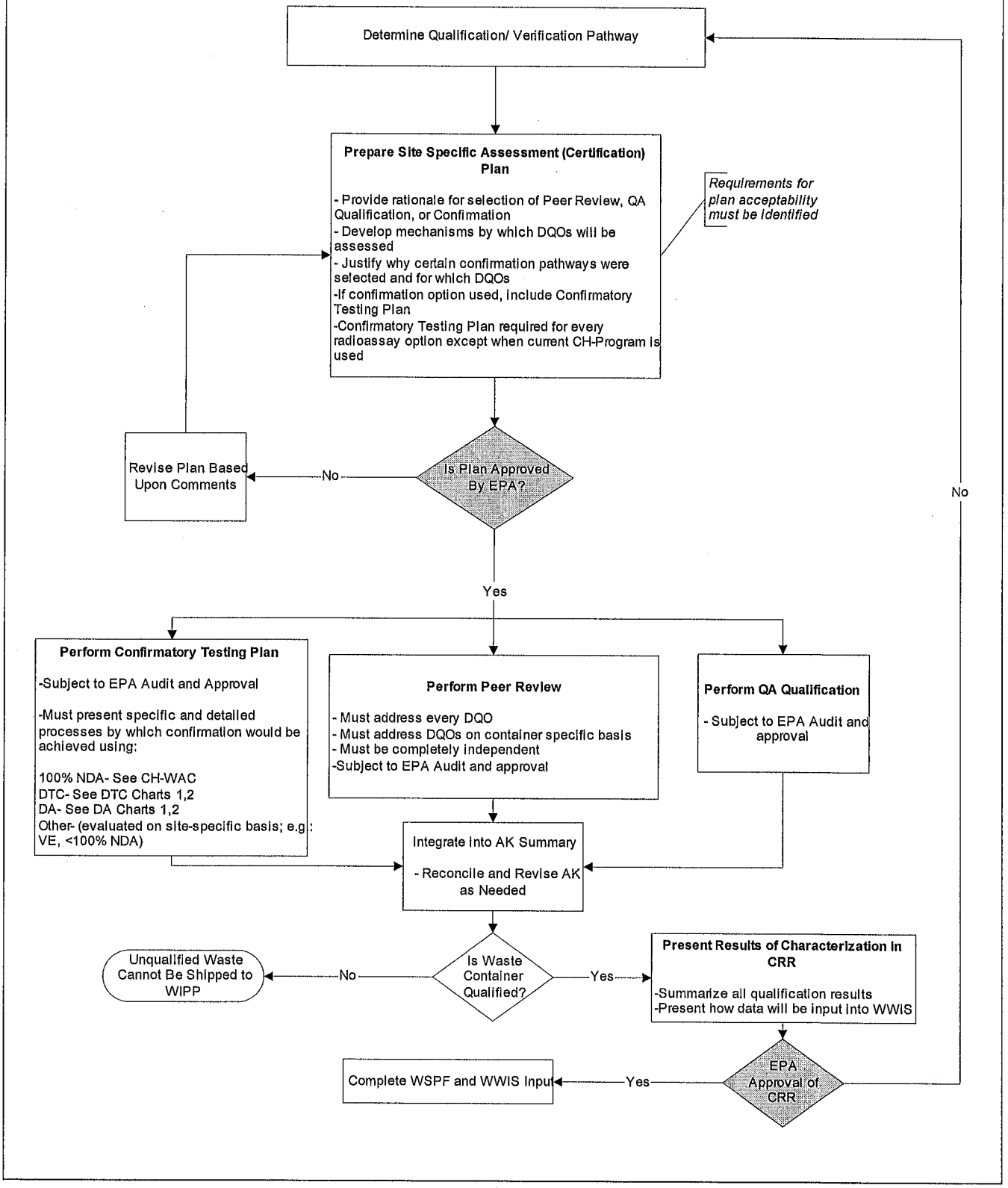
AC-23. Revision 7, Page 14. In estimating the uncertainty of the dose rate a geometric mean is used to estimate the dose rate from the two measurements. This calculation appears to differ from the arithmetic mean (or maximum) described on pages 8 and 9. This discrepancy requires further explanation.

AC-24. Revision 7. At this time we are not certain whether 40 CFR 194.23, "Models and Computer Codes," apply to modeling of the radionuclide ratios, using ORIGEN for example, or the modeling of the container and waste matrix shielding properties, using MCNP or QAD-CGGP. If we determine that §194.23 is only applicable to the modeling of the WIPP repository itself, then the QA requirements provided in Section 194.22 would still be applicable.

Site Specific RH Waste Characterization Process Flow Diagram Guidance
(For Information Only)



Site Specific RH Waste Characterization Process Flow Diagram Guidance (Continued)
(For Information Only)



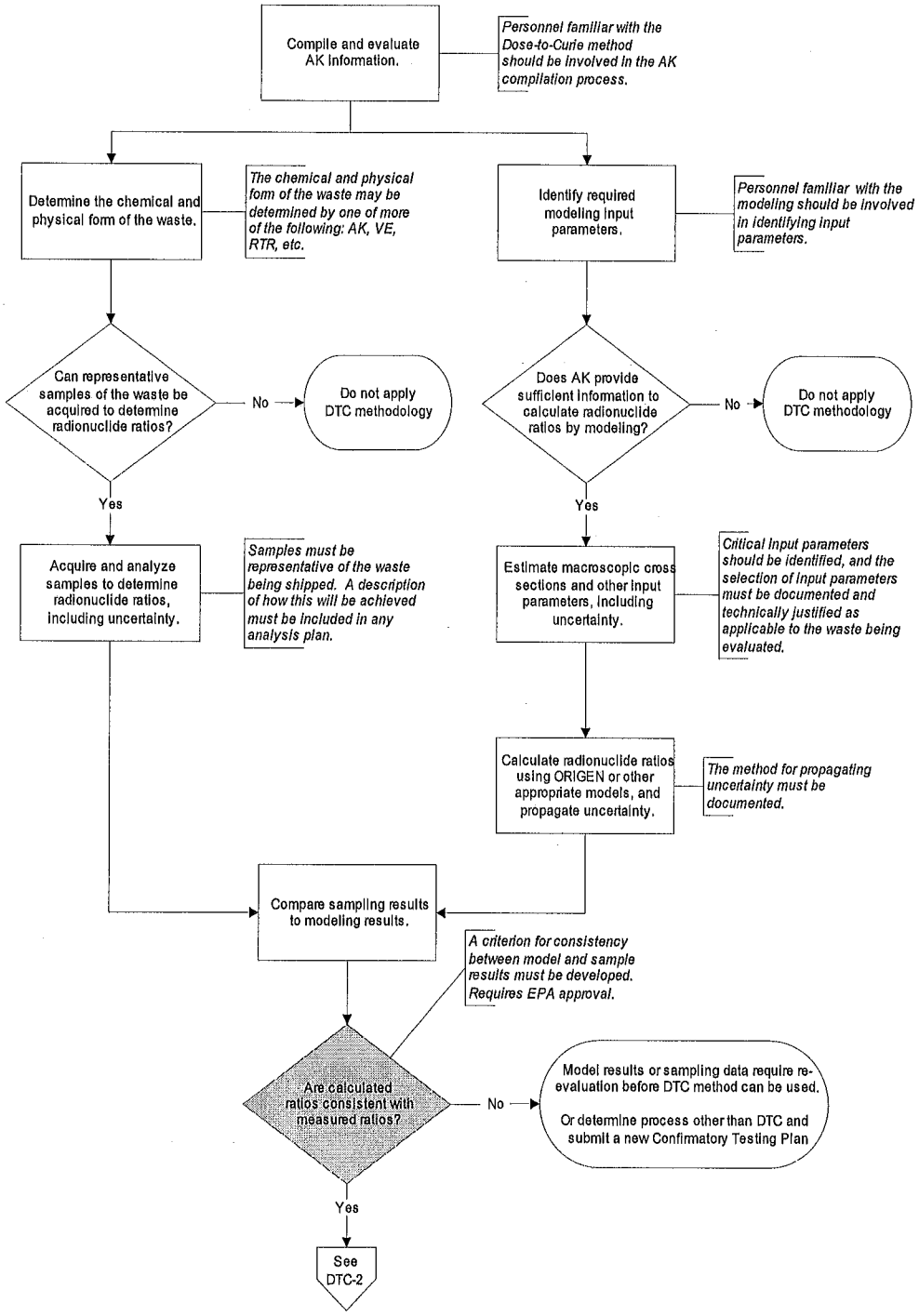
DTC Chart 1

Requirements of DTC Confirmation Plan should included but not be limited to:

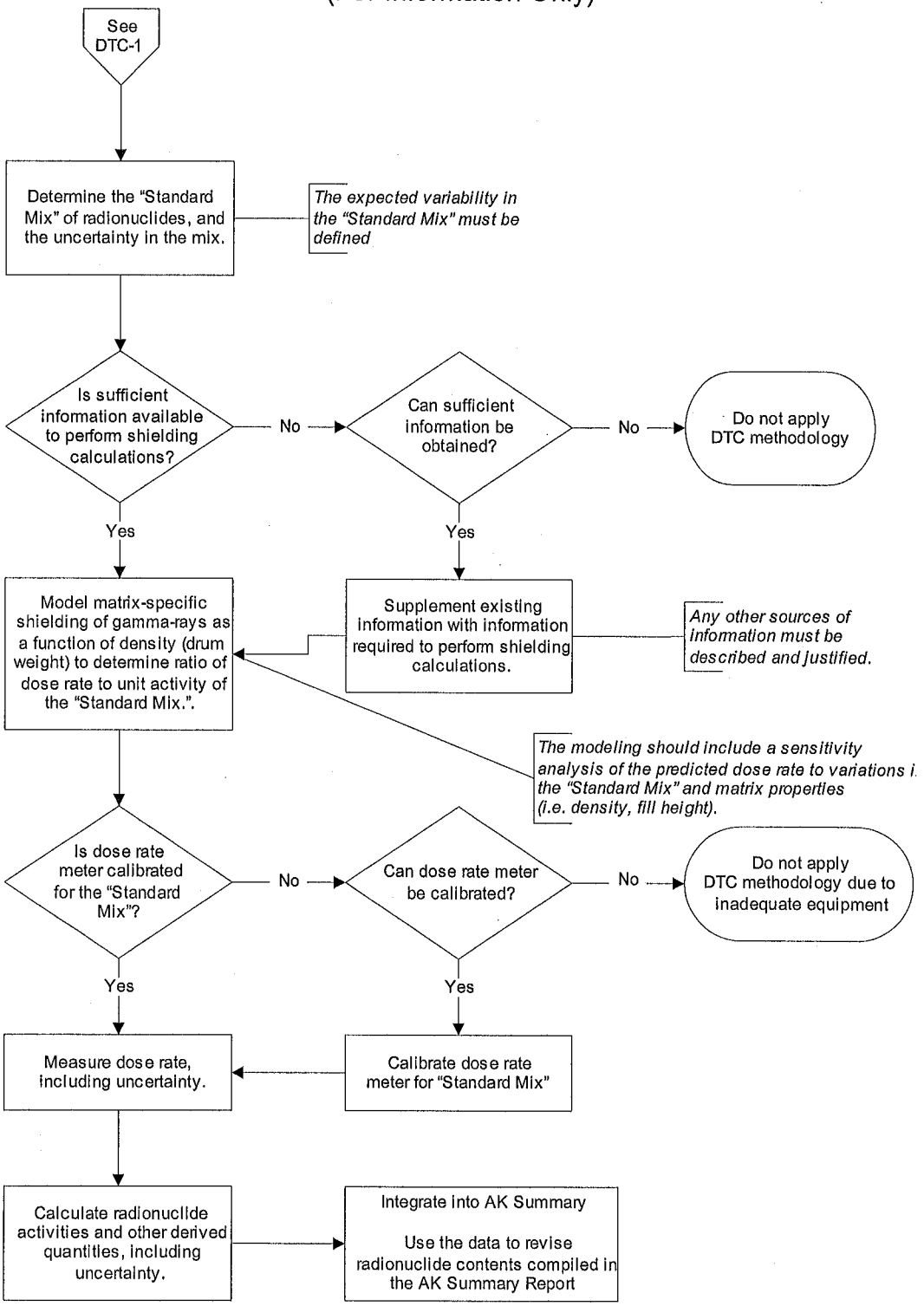
- Identify DTC Options and criteria for selecting each of these options.
- Define types of waste that are eligible for DTC confirmatory assessment (physical and chemical limitations)
- Define Data Quality Objectives (DQOs) for activities related to the DTC method, including sampling, modeling, and dose rate measurements
- Establish radionuclide ratios for each of the ten (10) WIPP-tracked radionuclides: ^{90}Sr, ^{137}Cs, ^{233}U, ^{234}U, ^{238}U, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{242}Pu, and ^{241}Am.
- Establish ratios of any radionuclides that contribute to the measured dose rate (i.e. ^{60}Co).
- Specify sampling-related requirements. Samples used to establish radionuclide ratios should be demonstrated to be representative of the waste, meaning that radionuclide ratios in the sample are the same as those in the waste. See DA Chart 1 for specific criteria.
- Document and justify inputs to models, such as ORIGEN, used to estimate radionuclide ratios. In particular, this must include information about the burn-up histories, reaction rate cross sections, and decay times.
- Ensure shielding models account for all important matrix properties, including but not limited to density, fill height, effective atomic number, gamma-ray energies, build-up factors, source distribution in the container, actual measurement conditions (i.e. surrounding materials, background).
- Perform a sensitivity analysis for any modeling that is conducted, in order to identify critical parameters. All input parameters should be documented and justified.
- Calculate Total Measurement Uncertainty (TMU) for DTC, also addressing the following issues:
    - Radionuclide ratios when measured by sampling
    - All critical input parameters to any models used to estimate the radionuclide ratios and the propagation of the input parameter uncertainties to any results
    - All critical input parameters to any shielding modeling results used to estimate the relationship between measured dose rate and total activity of the "Standard Mix" of radionuclides
    - The measured dose rate

- Dose rate meters should be properly calibrated for the "Standard Mix" of radionuclides.
- Define criteria for demonstrating that DTC data reconciles with AK
- Define requirements for the use of DTC results in WWIS reporting
- Define reporting and content requirements for DA portion of CRR Report

DTC Chart 2
Site Specific Dose to Curie (DTC) Test Plan
(For Information Only)



DTC Chart 2
Site Specific Dose to Curie (DTC) Test Plan (Continued)
(For Information Only)

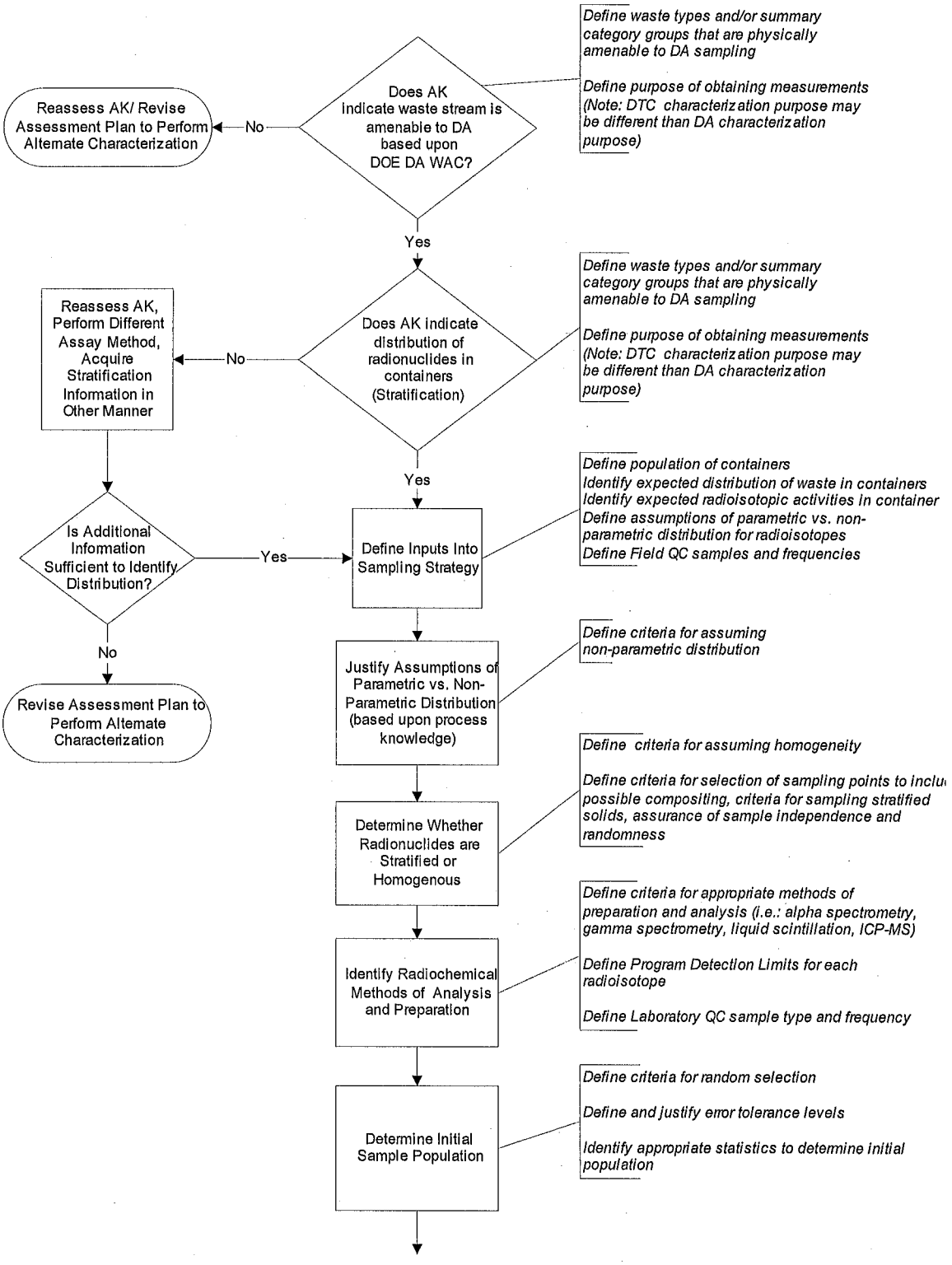


DA Chart 1

Requirements of DA Confirmation Plan should included but not be limited to:

- Specify DA specific DQOs (i.e.:)
    - Define tolerable limits of error
    - Define minimum levels of detection
- Define types of waste that are eligible for DA confirmatory testing (physical and chemical limitations)
- Define criteria for initial distribution assumptions (Parametric vs. Non-Parametric)
- Define criteria for determining appropriate sampling procedures within a drum
    - Homogenous
    - Stratification
- Define appropriate methods of analysis for each measured parameter that allow DA specific DQOs to be met
- Specify appropriate field QC tests, limits, and frequencies (Field QAOs)
- Specify appropriate method specific analytical QC tests, limits, and frequencies (Analytical QAOs)
- Specify appropriate analytical calibration requirements
- Specify data validation and data usability requirements to Assess QAOs
- Define usable data
- Establish criteria for use of non-detected results with detection limits that exceed detection limits
- Establish criteria for use of non-detected results
- Establish criteria for use of result uncertainties in calculations
- Establish criteria for confirming actual distribution of results (normal, lognormal, non-parametric)
- Establish criteria for data transformations
- Establish criteria for determining if appropriate numbers of samples are collected to meet error tolerance DQO
- Define criteria for demonstrating that confirmatory data reconciles with AK
- Define requirements for use of confirmatory testing data in WWIS reporting
- Define reporting and content requirements for DA portion of CCR Report

DA Chart 2
Site Specific Destructive Assay (DA) Plan
(For Information Only)



DA Chart 2
Site Specific Destructive Assay (DA) Plan
(Continued)
(For Information Only)